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ABSTRACT

A study investigated whether instructors in schools with formal staff development programs were more technologically up to date than instructors in schools with less formal programs. The study used existing data from program evaluations of five postsecondary technical institute (TI) instructors. A survey instrument collected data from 120 (of a sample of 153) postsecondary TI instructors. Findings indicated that formalized staff development programs were not identified within the TIs. Respondents rated workshops, conferences, and seminars sponsored by business and industry as the most effective updating activity. Other activities in descending order of rated effectiveness were work-experience internships, activities sponsored by professional and trade organizations, and industry observation and visits. Forty hours appeared to be the upper limit on time committed to an individual staff development activity. Instructors rated "not enough time in schedule" as the most substantial barrier to being technologically current. They indicated a "high need" for updating. Instructor-suggested criteria for assessing the technical currency of an instructor fell into typical categories: knowledge, work activity, updating activity, attitude/motivation, external evaluations, teaching activities, and performance test. (The instrument and 24 references are appended.) (YLB)

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Instructor Technical Currency: Effectiveness of Activities, Barriers and Updating Needs

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July 1989

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CHAPTER 1

INTRODUCTION

The rapid pace of technological change in our post-industrial society makes it increasingly difficult for technical institute (TI) instructors to remain technologically current. Hamilton and McElroy (1983) reported that nearly one-half of all postsecondary vocational instructors in a nine state study were considered in need of technological updating. Technological updating has been defined as "the technical (as opposed to pedagogical) knowledge and skills needed by vocational/technical teachers and instructors to provide their students with up-to-date preparation for the current technology of the world of work" (Wonacott & Hamilton, 1983, p. vii).

The need for educators to keep pace with current technology has become a major concern shared not only by instructors but by administrators and policy makers as well. Instructors believe that they must pursue continuous training and updating or risk becoming "obsolete" in a relatively short time period. Zellner and Parrish (1986), in a study of 1,141 vocational teacher educators, reported that "keeping all vocational teachers technologically current" was ranked third out of 68 "critical issues" in vocational education.

The longer TI instructors are away from their industry of experience, the more likely it will be that they need some type of updating. A study of Florida vocational technical teachers (Rader, 1984) found that the average length of time which instructors had been out of teaching related employment was seven years. Although the percentage of instructors who reported a need for updating varied by field, instructors in all fields reported a need for some type of updating.

Administrators and policy makers are also aware of the need for technological updating, since not only are they pressed by instructors for more flexible policies in delivering updating activities, but also by their concern for program quality and relevance. A study of 57 state and territorial directors of vocational education conducted by the National Vocational-Technical Education Program Improvement Coordinating Council (Adams, 1985) identified technical update and high tech topics as the most critical inservice education subjects.

While there appears to be a general consensus that the problem of keeping vocational teachers technologically current is both imminent and important, there is far less agreement on the most effective methods for providing such training. Recent research on methods for providing technological updating has produced a number of lists of activities purporting to indicate the "effectiveness" of certain methods for technological updating (Hamilton & Wonacott, 1983; Preskill, 1985). Concurrently, lists of "unsuccessful" technological updating activities have also been identified (Instructional & Student Support Section, Minnesota State Board of Vocational-Technical Education, 1985; Preskill, 1985).

These lists of effective updating practices provide a smorgasbord of activities which sometimes are imbued with a considerably greater degree of idealism than practicality. For instance, in 1983, on the basis of reports citing the effectiveness of paid internships for instructors, Minnesota developed a pilot program to allow instructors to take paid leave time for such placements. The high cost of this activity (since not only were teacher salaries paid, but a substitute had to be located and also paid) was not adequately funded, and the internship was not available to many instructors.

Solutions to technological updating derived from needs assessments and based on the "perceived needs" of teachers versus their "actual needs" can also be problematic. It has often been observed that those who least need professional development will most actively seek it. There has been very little attention directed toward investigating the relationship between the "perceived needs" of instructors versus the actual amount of time they spend in updating activities. Failure to examine this relationship may result in updating being designed for and provided to those who least need it.

Another problem in providing technological updating concerns what might be called the centralization versus decentralization issue. In other words, on whom should the responsibility rest for staff development? How much initiative should rest with state officials versus individual teachers? Preskill (1985) stated that teachers would like to see the State Board of Vocational Technical Education (SBVTE) take a leadership role in encouraging local districts to allow teachers to participate more fully in development activities. Kane and Chase (1983) reported that many structured staff development activities have been fragmented, and that teachers have not held such staff development activities in very high regard. They argued that staff development programs will not be effective unless they are based on a clearly demonstrated need, the active involvement of recipients, and a systematic coordination to ensure the maximum impact of resources expended.

Traditionally, educators report numerous barriers to their involvement in staff development activities which are not easily overcome. Wonacott and Hamilton (1983) suggest that these barriers may account for the fact that "vocational teachers, as a whole, are not staying up-to-date with the fast-changing technologies of their fields" (p. 56).

Problem and Objectives

The concern which this study addressed was the need to keep experienced postsecondary TI instructors technically current to ensure that program completers are provided the current skills and knowledge needed for employment. Given the pace of technological change occurring in American society, postsecondary TI instructors can rapidly lose the ability to provide students with current skills and abilities needed in their respective fields unless some type of updating is secured. This problem is being exacerbated by the continuing accelerated pace of technological development, the higher cost of updating, and the competition between schools and industry for qualified instructors.

This basic concern is complex. To gain insight, a number of more specific problems or questions must be considered. For example, one specific problem is to identify the most cost-effective methodologies for ensuring that TI instructors are able to keep abreast of changes in their fields. The solution to this problem requires developing a better understanding of the relationship between the effectiveness of various updating methodologies and the probability that instructors will be able to utilize the method and costs.

Another more specific problem is the need to develop a better understanding of the technical updating processes which TI instructors currently utilize given existing policies. Clarification of this problem also requires a better understanding of the relationship between technological updating and specific administrative policies designed to encourage updating activities.

There also is the problem of relating the perceived technological updating needs of instructors to their actual needs. This problem requires a closer examination of the technological updating activities actually undertaken by instructors, their own assessment of their technological currency, and an independent assessment of instructors provided by student or program evaluators.

Perhaps the most fundamental problem is the need for criteria for assessing the technological currency of TI instructors. This problem requires a clarification of experts' criteria and the validation of these criteria.

While the above mentioned specific problems are integral to the major concern--experienced TI instructors' need to remain technologically current--the objectives of this study also derived from equally important and integral problems which have been stated as objectives.

The study objectives were:

1. To determine whether instructors in schools with formal staff development programs were more technologically up-to-date than instructors in schools with less formal programs.

2. To identify instructors' perceptions of the effectiveness of selected activities designed to help them remain or become technologically current.

3. To identify the methods which instructors most often select to remain technologically current.

4. To determine instructors' ratings of selected barriers to their becoming or remaining technologically current.

5. To develop criteria for assessing the technological currency of TI instructors based upon instructors' recommendations.

CHAPTER 2

REVIEW OF THE LITERATURE

The following review of the literature briefly examines two areas of the literature directly related to the objectives of this study: updating methods and delivery techniques and barriers to technological updating. While the staff development literature provides a broader context for the major concern of this study, keeping experienced TI instructors technologically current, it is not reviewed. It was assumed that a staff development program would be accepted as essential to maintaining technical currency.

Updating Methods and Delivery Techniques

A study by Wonacott and Hamilton (1983) identified six "promising approaches to the provision of technological update to vocational teachers" (p. vii). These six techniques were identified through a review of the literature, opinions from selected observers, and reports from vocational institutions and agencies. The six "promising" techniques include (a) work experience internships; (b) university and college course work; (c) workshops, conferences, and seminars; (d) industry observation and visits; (e) education and industry staff exchange; and (f) part-time employment.

Work experience internships generally involve the lending or return of instructors to a business or industry for actual on-the-job training. Instructors are usually allowed release time from teaching for this purpose, and are compensated by the school for the time spent in their work experience internship.

University course work is one of the most common methods for the provision of technological updating. Instructors may take classes as part of a planned curriculum or elect to take individual courses in which they are interested. Many TIs provide reimbursement for courses that have been approved as part of a program for updating. Wonacott and Hamilton (1983) distinguish such course work from a "bona fide university update program." They noted that "a university update program, however, usually has a more formal needs assessment component, ensuring that the update activity is appropriate to the teacher's needs and will result in improved instruction" (p. 9).

Workshops, conferences, and seminars usually refer to short, non-degree credit training programs sponsored by a variety of

organizations. Schools, departments of vocational and technical education, professional organizations, businesses, and independent consultants all offer a wide range of training activities. Such activities range in length from one hour to eight hours a day for several days. Often continuing education units will be offered for workshops approved by a certification board. Wonacott and Hamilton (1983) found that "in most instances there is no perceptible difference between a workshop and a conference and a seminar - nomenclature appears to be highly individual and a matter of taste" (p. 14).

Industry observation entails visits to industry for the express purpose of observing knowledge and skills of new technology that is not available to the school. Such visits are often arranged on behalf of students. While the duration and structure of industry visits varies, industry visits allow instructors the opportunity for first-hand observation of the latest equipment and skills being used.

Education and industry staff exchanges involve a reciprocal arrangement wherein an instructor takes the place of a employee from a cooperating business and the employee assumes the teaching responsibilities of the vocational instructor. Usually each person is paid by their respective employers for the duration of the exchange. The length of a staff exchange varies from two weeks to several months and is usually specified as part of a formal written agreement specifying legal obligations and responsibilities. This arrangement allows the vocational instructor an opportunity to actually participate in the latest technological practices in the field.

Part-time employment is the sixth update activity identified by Wonacott and Hamilton (1983). Many instructors use their vacation time or academic breaks to work for an employer in a field related to their teaching. This type of update activity is usually unregulated since it involves instructors' time. Part-time employment provides a mode of free instructor updating for the school, but quality control may be a problem.

In addition to the six "promising" update activities described above, Wonacott and Hamilton (1983) identified six other approaches as "in plain terms, lower potential, for allowing teachers to acquire up-to-date knowledge and skills they need in today's technological work place" (p. 51). These practices are (a) membership in professional or trade organizations, (b) professional reading, (c) advisory committee contacts, (d) in-house cross-training, (e) coordination of student activities, and (f) outside consulting work.

A study by Preskill (1985) examined the development needs of secondary vocational educators in Minnesota. One of the questions asked in a series of focus interviews with vocational

educators was, "What are the preferred learning structures of secondary vocational education teachers?" Their conclusion was, "The most preferred delivery structure for development activities is a one- or two-day intensive workshop held within 150 miles of the teachers' home school" (p. 25). In addition to workshops, teachers expressed a preference for more opportunities to participate in industry internships that last from two to six weeks. They also indicated a desire to have more people from local industry brought into the school to provide local inservice activities. Preskill (1983) also found a strong interest in delivery structures for providing technical updating to outstate vocational educators.

Johnson and Summers (1984) conducted a survey of professional development needs with secondary industrial arts/technology teachers in Minnesota. They listed a number of development activities and asked respondents to rate the amount of interest they had in each program. The highest rated activities were "programs that brought industrial arts/technology teachers together with members of industry for seminars and discussions" (p. 27). Teachers indicated a desire to participate in university credit experiences but preferred workshops over courses. Activities that were rated low included developing special interest groups for industrial arts/technology teachers.

Among the activities described as characteristic of "unsuccessful" staff development programs, the following activities were identified in a series of regional workshops held by the Minnesota SBVTE (1985):

1. Implementing a state-mandated system for staff development.
2. Boring state workshops.
3. "Short shots" which only scratch the surface of needs.
4. Too generic inservice programs.

Conclusions

The literature suggests that instructors want a wide range of activities available for technical updating. There is a higher regard for technical updating activities provided by business and industry than by state agencies or universities. The highest-rated activities tended to be those in which the instructors were more actively involved, as in work-experience internships. Nevertheless, most participants evidenced a desire to have university classes available if they "make all attempts to design courses that will meet the needs of practicing vocational teachers" (Preskill, 1985, p. 32).

State agencies were seen as having a role in which they continue to offer a number of ongoing workshops for staff

development, and function as a sort of bridge or catalyst to link teachers with other worthwhile activities.

The process of asking instructors to rate a series of activities and then proceeding to act as though the rating of a particular activity is commensurate with its effectiveness has shortcomings. There is little empirical evidence suggesting an activity which is highly rated is also effective. There is also little or no evidence linking specific update activities to their actual ability to keep instructors current with their field. The effectiveness assumption rests on the logic that an adult learner is the best judge of how they learn.

The second problem with using instructor ratings as a guide to program development is more pragmatic. Ratings do not take into consideration real-world constraints in terms of both time and money. Industry-sponsored programs and workshops tend to be more expensive than programs sponsored by either state agencies or universities. There is a bewildering array of workshops offered by industry consultants and it is a market where the dictum "caveat emptor" reigns. For school programs wherein money is in short supply for staff development, it is a challenge to determine which programs are a bargain and which are worthless at any price.

Program Barriers

Wonacott and Hamilton (1983) identified four factors which can function as either barriers or facilitators in providing technological updating. These four factors are (a) resources, (b) motivation, (c) policy, and (d) access. They note that access is a factor which "operates only to a limited extent....and appears for the most part to be considerably less critical than the other three factors discussed" (pp. 55-56).

Resources refers to the money needed to pay for update activities. This may include reimbursement for classes, books, travel, meals, and time off. Motivation is not defined by Wonacott and Hamilton and little is said about what factors contribute to motivation. An argument put forth by Fossum, Arvey, Paradise, and Robbins (1986) maintains that motivational factors are one of the prime influences affecting an individual's currency. Fossum et al. (1986) stated that "skills obsolescence is probably a function of motivational and external factors, and could be avoided by modifying job rewards" (p. 371).

An example of a policy which affects teachers' ability to stay current is state certification rules. Wonacott and Hamilton stated that "policy toward teachers' responsibility to keep up-to-date becomes as critical a factor as resources and motivation" (p. 56).

Adams (1985) identified 10 most critical barriers to meeting updating needs. The three most important were (a) funding and support, (b) professional commitment and teacher time, and (c) limited professional improvement staff. Funding and support were identified as "by far the most crucial barriers to meeting inservice education needs of vocational education personnel during the next 3 years." (p. 8).

A comparison of the Wonacott and Hamilton (1983) and Adams (1985) list of barriers provided some interesting differences. Both lists identified funding as either the most critical barrier or one of the most critical barriers. Adams identified lack of a system of recognitions and rewards as the sixth most critical barrier to effective staff development. This factor appeared to be the only one in the Adams study which would correspond to the issue of motivation addressed by Wonacott and Hamilton (1983). The Adams list did not appear to identify any issues that would correspond to the policy barrier identified by Wonacott and Hamilton. On the other hand, the issue of teacher time was not included by Wonacott and Hamilton as a major barrier.

The study of Minnesota secondary vocational education teachers conducted by Preskill (1985) identified the following list of major barriers to staff development: (a) lack of time, (b) lack of incentive, (c) lack of local administrative support, (d) cost, (e) timing of development activities, and (f) summer employment prohibiting updating activities.

There is considerable correspondence between Preskill's findings and those of the Adams study and the Wonacott and Hamilton study. The issues common to two or more of the above studies include (a) lack of time, (b) lack of incentives, (c) lack of funding, and (d) lack of administrative support. The issue of money is somewhat tangential to each of these factors. According to Preskill, money is one form of incentive that can be used to upgrade teacher technical currency.

The series of regional workshops conducted by the Minnesota SBVTE in February of 1985 identified a number of characteristics of "unsuccessful" programs. Some of these items are more specific than the factors noted above, but all of them posed barriers to effective delivery of staff development activities. While money was again identified as critical for effective staff development, other problems were associated with a state-mandated system for staff-development, overregimentation of processes for obtaining updating, and not involving teacher institutions in state staff development efforts. A number of educators indicated a desire for a state master plan for staff development. Apparently teachers want more guidance from the state without more regimentation.

A study by Meir (1983) highlights the fact that the issue of worker professional development is also being investigated in the business sector. Meir examined the interaction of flexible work hours on workers' propensity to pursue upgrading activities. Meir noted that a 1977 study by the National Institute of Work and Learning found that only 4% to 6% of workers in the U.S. participate in industry-sponsored tuition assistance programs. Meir concluded that tuition reimbursement programs alone are not the answer to worker upgrading. She argued that organizations need to develop "specific means to encourage employee participation when they are committed to broadly-based education and training programs" (p. 19). Meir identified the use of flexible work patterns as one means of assisting workers with the problem of employee development.

Conclusions

The individual barriers to technical updating can be categorized according to two major dimensions. Both dimensions might be described as responsibility domains. One domain includes a set of factors which is controlled by the organization or institution employing the teacher. This domain includes such factors as amount of training provided, policies towards training, amount of training resources available, and so on. The other domain includes a set of factors attendant to the unique characteristics of each individual. This includes such factors as personal motivation, amount of free time, knowledge, skill, abilities, aptitudes, and so on. Each of these factors is related to a unique chain of effects which are entwined with the specific lifestyle and behavior of a given individual.

A review of the barriers previously identified illustrates the extent to which the individual domain and institutional domain are enmeshed. For example, motivation affects the desire of individuals to pursue training or to request further training, while simultaneously, the rewards that an institution provides for training and currency affect the motivational level of individuals. Thus, it seems apparent that attempts to develop updating strategies which ignore the interrelationship of personal and organizational factors will be futile.

If it is more useful to consider updating strategies from a perspective which accepts the interrelationship of organizational and individual factors, then perhaps the real issue is what types of motivators are most important. Herzberg (1959) described two sets of motivators which might be termed intrinsic and extrinsic. According to Herzberg intrinsic motivators are more powerful than extrinsic motivators. Nevertheless, Herzberg recognized that some minimum level of extrinsic motivation had to be available. Without this base level of extrinsic motivation, individuals are not likely to be motivated to pursue updating activities.

CHAPTER 3

PROCEDURES

This chapter describes the study, subjects, instrument, data collection methods, and data analysis methods that were used in this project.

Research Design

The strategy selected to meet the research objectives of this study included use of existing data and survey data. The historical data were available from the SBVTE. The survey data were collected from a sample of postsecondary TI instructors in Minnesota. The SBVTE has conducted an annual program evaluation that included an assessment of the technological currency of postsecondary TI instructors. Each year five TIs are selected to undergo a comprehensive system of program evaluation by independent specialists and industry experts. The evaluation reports appeared to provide an external, objective measure of technical currency with which to compare instructors' inservice activities and perceptions. Since change over time is a confounding factor, only the reports from the most recent cycle (1985) of evaluations were considered by the researchers. The necessity to have "up-to-date" evaluation information led to the use of instructors from the five schools in the 1985 cycle as subjects.

Sample

While the population for this problem included all experienced postsecondary TI instructors in Minnesota, a select sample of instructors from five TIs rather than a random sample was used because SBVTE data existed. To avoid the problem of occupational experience carry-over effects, instructors with five or more years of experience at the postsecondary level were selected as subjects. The five-year licensure renewal period and logic suggested that instructors with more than five years of experience are more likely to be impacted by currency issues. Five years also appeared to be a time frame during which most occupations undergo technological change. In short, instructors with more than five years of teaching experience appeared to have the greatest potential need for technological updating.

The researchers compiled a list of all instructors at the five schools selected for inclusion in this study. For reasons

of confidentiality these schools will be referred to as schools A, B, C, D and E. The directors of the five schools were contacted and instructors with less than five years of experience were eliminated from the sample population. This yielded a final potential subject sample of 153 subjects.

Instrumentation

The instrument used was constructed for this study. It consisted of 12 major questions which included multiple responses. Question format included check-off lists, Likert scales, and a few open-ended response options. The questions and items included were based on the study objectives.

A first draft of the instrument was reviewed by non-project co-workers in the Minnesota Research and Development Center for Vocational Education. A second draft was completed incorporating the suggestions made. This draft was sent to the Director of Staff Development at District 917 TI, who had agreed to ask 10 TI instructors and administrators to review the instrument and comment on its format and clarity. Eight of the questionnaires were returned with responses and comments. These surveys were reviewed and appropriate revisions made to prepare the study instrument (see Appendix).

Data Collection

The first step in the data collection process involved reviewing the program evaluations for the five schools. Formal permission to examine these records was obtained from each of the seven SBVTE program specialists who were responsible for monitoring the quality and effectiveness of the programs in their area. Data were recorded for seven items on the program evaluation form. The item most germane was "Are instructors current with the technological changes in the industry?"

The survey instrument, cover letter, and return envelope were mailed to the subjects requesting response within two weeks. Follow-up letters were mailed, and telephone calls were made to those not responding to the second mailing.

The original mailing resulted in 85 responses. The follow-up letter resulted in 24 more surveys being returned. Phone calls resulted in 11 more surveys returned. The final response rate was 78%. The response rates for subjects by school are shown in Table 1.

It was judged that reasonable steps had been taken to increase response rates and a random sample of 10 non-respondents were selected for phone interviews. Two individuals could not be reached and were replaced by randomly selected non-respondents. Due to the length of the survey, a decision was made to compare

Table 1

Number of Subjects and
Response Rates by School and Total Sample

	Number		
School	Sample	Respondents	Percent
A	32	26	81
B	13	12	78
C	16	10	63
D	21	16	76
E	71	56	79
Total	153	120	79

respondents (Rs) with non-respondents (NRs) on a limited number of key items. Questionnaire items 8, 9 and 10 were used in the interviews.

The data were compared using t-tests. For 3 of the 10 items compared there were calculated differences. NRs reported spending a significantly different amount of time in updating activities than Rs ($p < .01$, mean for NRs = 765 hours, mean for Rs = 419 hours). NRs were similar to Rs in their ratings of barriers to updating activities with one exception. NRs rated the barrier, school did not encourage staff development activities, different than Rs ($p < .001$, mean for NRs = 1.2, mean for Rs = 1.9, scale 1 = very low barrier to 5 = very high barrier). Finally, NRs reported a significantly different need for updating in applying new technology in the classroom than Rs ($p < .05$, mean for NRs = 2.8, mean for Rs = 3.5, scale 1 = very low need to 5 = very high need).

The question of differences was "Are the NRs simply not questionnaire completers or are they different than Rs relative to inservice activities?" Given the small number of NRs, the differences were judged to have limited impact on the potential findings of this effort.

Following the return of the survey questionnaires, the directors at each of the five participating schools were sent an abridged version of the survey instrument (items one through seven). This was done to assess the reliability of instructors' perceptions of the updating practices and policies at their schools. For example, both instructors and directors were asked if their school had a formal staff development policy.

Data Analysis Procedures

The data from the survey instruments sent to the instructors, and the abridged version sent to the directors, was input at the St. Paul Computer Center using the mainframe computer and analyzed with the SAS program. A random sample of ten surveys was selected by the researchers and rechecked to verify the accuracy of the data input procedures. No random errors were found and systematic errors were corrected. Data printouts were subsequently run and the data reviewed for any discrepancies. The printouts showed no discrepancies.

Based upon the raw data, the researchers made one judgment which the reader should note. For questions requesting the amount of time spent in specific activities the researchers set a top limit of 999 hours for any single activity during the past year. This was done assuming 1000 in a single updating activity is extremely high. Nevertheless, six individuals reported spending more than 1000 hours in part-time work during the past 12 months. The only other category where a respondent reported spending more than 1000 hours was in professional reading. One respondent reported spending "1000?" hours in professional reading.

Means and frequency distributions for the data were calculated for all items. T-tests and correlations were run to obtain data relevant to the research objectives and to identify the significance of the research findings. The questionnaire design proved to be adequate not only for providing the data relevant to the research objectives but also allowed the researchers to look at several other relationships.

CHAPTER 4

RESULTS

The results are reported in six sections representing the six study objectives. The researchers have attempted to report the critical data which revealed useful information for the prospective reader.

Objective 1: Staff Development Programs

The first six items on the questionnaire were included to determine individual TI inservice education practices and policies. The primary concern was to determine if formal inservice programs were provided. Two key practices were used to define operationally the existence of a formal program: regularly scheduled technical updating workshops or courses and written staff development policy. Respondents were asked to check the practices which applied to their school. With the exception of school A, the majority of the instructors indicated their school did not have regularly scheduled technical updating workshops or courses. The percentage of instructors per school not reporting existence of written staff development policy ranged from 58% to 90%.

Directors of the individual schools also responded to these items. Table 2 includes selected items and compares the responses of the instructors and administrators by school. The administrators did not indicate that their individual schools provided regularly scheduled technical updating workshops or had written staff development policy. This was basically consistent with the instructors' responses; however, the percentages of agreement suggested that the reliability of instructor responses was not high enough for additional statistical analyses.

The directors' responses to Item 1 on the questionnaire were very consistent. All five administrators agreed on the absence of the two key practices items noted above. However, they all reported the existence of the following practices:

1. Irregularly scheduled technical updating workshops or courses.
2. Paid subscriptions to journals or other publications.
3. Reimbursement for credit technical updating workshops or courses.

Table 2

Directors' Responses and Percentage of Agreeing Instructors for Selected Staff Development Practices by School

Practices	School A	School B	School C	School D	School E
Regularly Scheduled Workshops	D: NO I: 46%	D: NO I: 67%	D: NO I: 70%	D: NO I: 75%	D: NO I: 74%
Irregularly Scheduled Workshops	D: YES I: 50%	D: YES I: 83%	D: YES I: 30%	D: YES I: 69%	D: YES I: 75%
Written Staff Development Policy	D: NO I: 58%	D: NO I: 67%	D: NO I: 90%	D: NO I: 88%	D: NO I: 82%
Paid Journal Subscriptions	D: YES I: 100%	D: YES I: 83%	D: YES I: 70%	D: YES I: 69%	D: YES I: 93%
Paid Professional Memberships	D: YES I: 62%	D: YES I: 58%	D: YES I: 30%	D: NO I: 75%	D: NO I: 60%
Reimburse Non-Credit Courses	D: YES I: 58%	D: YES I: 83%	D: YES I: 30%	D: YES I: 38%	D: YES I: 75%
Reimburse Credit Courses	D: YES I: 58%	D: YES I: 83%	D: YES I: 80%	D: NO I: 81%	D: YES I: 53%
Paid Travel	D: YES I: 100%	D: YES I: 91%	D: YES I: 60%	D: YES I: 94%	D: YES I: 93%
Paid Lodging	D: YES I: 100%	D: YES I: 75%	D: YES I: 50%	D: YES I: 94%	D: YES I: 91%

4. Paid travel for technical updating activities.

5. Paid lodging and meals for technical updating activities.

Three administrators reported the practice of paid personal memberships in professional organizations.

The second question was "Does your school offer sabbatical leave (i.e., extended time off to pursue refresher/educational updating activities)?" All schools offered "limited (less than

100%) paid sabbatical leave." Four of the schools provided 50% of regular salary during sabbatical leave, and the remaining school reported providing 75% of salary (Question 3).

The responses to Question 5 indicated that the five schools provided paid time off for instructors each month for technical updating activities, but the number of hours was not estimated.

None of the schools reported having annually budgeted dollar amounts for technical updating activities. This may suggest that the reason for schools not having established policy or regularly scheduled activities is budget limitations or priorities.

The second set of data needed to answer the question raised by Objective 1, "Are instructors in schools with formal staff development programs rated more technologically up-to-date than instructors from schools without formal staff development programs?", was collected from existing TI program evaluation reports. The data indicated that evaluators felt that most instructors were technically current because only 8 of the 121 instructors were not rated technically current.

Objective 2: Effectiveness of Updating Methods

Questionnaire Item 7 asked the respondents to rate the effectiveness of 14 activities in helping them to remain technologically updated. The response scale was NA = not applicable, 1 = very low effectiveness, 2 = low effectiveness, 3 = moderate effectiveness, 4 = high effectiveness, and 5 = very high effectiveness. Table 3 presents the frequency distributions, means calculated using the ratings and the standard deviations based on the 121 respondents.

Using the mean ratings as a summary, "Workshops, conferences, and seminars sponsored by business and industry" was the activity category rated as having the highest effectiveness in helping instructors remain technologically updated. The four activities following in descending order of rated effectiveness were (a) work-experience internships; (b) workshops, conferences, and seminars sponsored by professional and trade organizations; (c) industry observation and visits; and (d) part-time employment.

Pearson product-moment correlations were calculated between the individuals' effectiveness ratings and their reported time spent in the selected activities. The results are shown in Table 4. Statistically significant relationships beyond the .01 level were obtained for the activities (a) workshops, conferences, and seminars by business and industry; (b) workshops, conferences, and seminars by professional and trade organizations; (c) part-time employment; (d) professional and trade memberships; (e) supervision of students in internship or work experience

Table 3

Instructors' Ratings of Selected Activities' Effectiveness in Helping Them Remain Technologically Up-To-Date

Activity	Effectiveness							
	NA	1	2	3	4	5	M	SD
Work experience internships	29	2	4	19	29	38	4.1	1.00
University and college course work	10	14	23	51	12	11	2.9	1.10
Workshops, conferences, and seminars sponsored by:								
1. Business and industry	7	-	1	16	42	55	4.3	.75
2. School or other educational agencies	9	6	13	47	29	17	3.3	1.04
3. Professional and trade organizations	8	2	6	23	43	39	4.0	.96
Industry observation and visits	5	1	4	33	46	32	3.9	.88
Education and industry staff exchange	49	5	5	24	18	20	3.6	1.17
Part-time employment	35	3	8	20	34	21	3.7	1.05
Professional and trade memberships	13	7	13	44	31	13	3.3	1.04
Supervision of students--internships and work	31	5	8	29	33	15	3.5	1.05
Professional literature	6	1	11	44	42	17	3.6	.89
Advisory committee or other committee	3	7	21	43	35	12	3.2	1.04
Outside consulting	39	7	5	29	34	7	3.4	1.02
Job placement of students	13	5	15	34	34	20	3.5	1.09

Note. The response scale was NA = not applicable, 1 = very low effectiveness, 2 = low effectiveness, 3 = moderate effectiveness, 4 = high effectiveness, and 5 = very high effectiveness.

Table 4

Relationship of Hours
Spent in Activity to Rated Effectiveness of Activity

Activity	r	p	n
Work experience internships	-.11	.31	92
University and college coursework	.14	.15	111
Workshops, conferences, and seminars by:			
Business and industry	.32	.00*	114
School or other educational agency	.13	.16	112
Professional and trade organizations	.41	.00*	113
Industry observations and visits	.18	.06	116
Education and industry staff exchange	.19	.11	72
Part-time employment	.42	.00*	86
Professional and trade memberships	.34	.00*	108
Supervision of students in internship or work experience programs	.41	.00*	90
Professional Literature	.10	.30	115
Advisory committee or other committee work	.34	.00*	118
Outside consulting work	.21	.06*	82

*p<.06, two-tailed.

programs; and (f) advisory committee or other committee work. The activities, industry observations and visits, and outside consulting, approached significance at the traditional .05 level with calculated probability values of .06.

To determine if effectiveness ratings were different for persons who were more involved in staff development activities in the previous year compared to those who were less involved, t-tests were completed. The high and low participation groups were defined as the individuals in the top 1/3 and bottom 1/3 of the distribution of individuals' total hours reported in these staff development activities the previous 12 months. Table 5 includes the results.

Table 5

Comparison of Effectiveness Ratings of Selected Activities in Helping Instructors Remain Technologically Current for High and Low Activity Participation Groups

	Group	n	M	SD	t	DF	p
Work experience internships	High	35	4.2	0.84	0.75	62	.45
	Low	29	4.1	0.84			
College course work	High	39	2.9	0.93	2.38	71	.02*
	Low	34	2.4	1.02			
Workshops, conferences, seminars by business and industry	High	40	4.4	0.81	1.41	74	.16
	Low	36	4.1	0.80			
Workshops, conferences, seminars by schools or other educ. agencies	High	40	3.3	0.94	1.71	72	.09
	Low	35	2.9	1.11			
Workshops, conferences, seminars by profess. and trade organizations	High	40	4.2	0.93	2.52	73	.01*
	Low	35	3.6	1.03			
Industry observation and visits	High	39	4.0	0.14	1.56	75	.12
	Low	38	3.7	0.15			
Education and industry staff exchanges	High	25	3.8	0.93	2.31	44	.03*
	Low	21	3.0	1.30			
Part-time employment	High	36	4.0	0.89	2.71	61	.01*
	Low	27	3.3	1.17			
Professional and trade memberships	High	40	3.5	0.96	2.71	72	.01*
	Low	34	2.9	0.91			
Supervision of students in internships or work experience programs	High	32	3.8	0.94	3.04	55	.00*
	Low	25	3.0	1.10			
Professional Literature	High	39	3.6	0.82	1.26	75	.21
	Low	38	3.3	0.90			
Advisory committee and other committee work	High	40	3.4	1.08	2.16	76	.03*
	Low	38	2.9	0.86			
Outside consulting work	High	32	3.7	0.95	2.92	52	.01*
	Low	22	2.9	1.06			

Table 5 (continued)

	Group	n	M	SD	t	DF	p
Job placement of students	High	39	3.5	1.02	0.90	67	.37
	Low	30	3.3	1.26			

Note. The scale of effectiveness was 1 = very low effectiveness to 5 = very high effectiveness.
*p < .05, two-tailed.

The mean ratings indicate that the high participation group rated all activities as having higher effectiveness than the low participation group did.

The t-tests for equivalence of the means for the high and low participation group indicated significant differences at the .05 level for these activities:

1. Workshops, conferences, and seminars by professional and trade organizations.

2. Part-time employment.

3. Education and industry staff exchanges.

4. Supervision of students in internships or work experience programs.

5. Outside consulting work.

6. Professional and trade memberships.

7. College course work.

Objective 3: Methods Instructors Select

The instructors were asked to report the hours which they spent during the past 12 months in selected updating activities. Table 6 provides an overview of the level of participation in each activity category. The activities are presented in order of their ranked effectiveness (based on the calculated means from Table 3). The number of respondents participating in each reported activity is reported as a percentage of all study respondents. The rank of the activity based upon percentage of participating respondents is presented. In addition, the percentage of the persons reporting having spent 1 to 40 hours in the activity is reported to reflect the extent of the reported participation.

Table 6

Summary of Respondents' Participation by Activity

Activity in Order of Ranked Effectiveness	Participation		
	Rank	Percent	% Reporting 1 to 40 hours
1. Workshops, conferences, seminars by business and industry	2	85.2	75.7
2. Work experience internships	12	28.1	39.3
3. Workshops, conferences, seminars by professional and trade organizations	6	66.9	85.2
4. Industry observation and visits	4	74.4	91.1
5. Part-time employment	10	33.9	12.2
6. Education and industry staff exchange	13	14.9	88.9
7. Professional literature	1	86.8	51.4
8. Supervision of students--internships and work	8	47.3	35.1
9. Outside consulting	11	31.2	74.4
10. Workshops, conferences, seminars by school or education agency	5	67.8	89.0
11. Professional and trade memberships	7	57.9	90.0
12. Advisory committee or other committee	3	84.3	91.2
13. University and college course work	9	46.3	75.0

Table 7 presents the results for internship and employment activities. The limited percentage of the total sample participation is a factor in interpretation: 28.1% participated in a work experience internship, 33.9% participated in part-time employment, and 31.2% participated in outside consulting. Three weeks (120 hours) of employment or less was reported by 87.5% of the respondents who were involved in work experience internships

Table 7

Frequency Distribution of Instructors' Time Spent During Previous Year in Selected Updating Activities: Internship and Employment

Hours	Work Experience Internship	Part-time Employment	Outside Consulting
0	87(71.9%)	80(66.1%)	82(67.8%)
1-40	13	5	29
41-80	8	3	4
81-120	7	5	4
121-160	1	4	4
161-200	1	2	-
201-240	-	1	-
241-280	-	-	-
281-320	-	2	1
321-360	-	-	
361-400	-	4	
401-440	-	-	
441-480	1	1	
481-520	1	5	
521-560	-	-	
561-600	-	1	
-			
681-720	-	2	
999	1	6	

and 94.9% of the persons reporting outside consulting activities. The range of hours reported by part-time employment participants was more uniformly distributed with 10.7% reporting 1 to 120 hours and 5.0% reporting over 999 hours of involvement.

The number of hours spent in college course work is reported in Table 8. Assuming 10 hours per credit, it appears that 57.1% of the instructors who did participate in college courses enrolled in three or less credits. An additional 32.2% of the participating instructors enrolled in four to six credits.

Participation in workshops, conferences and seminars sponsored by various groups is reported in Table 9. The popularity of these activities is reflected in the level of participation: (a) business and industry, 85.2%; (b) school or educational agencies, 67.8%; and (c) professional or trade organizations, 66.9%. One week (40 hours) or less of involvement was reported by 77.5% of the participants in events sponsored by industry, 89.0% of the participants in events sponsored by

Table 8

Frequency Distribution of Instructors' Time Spent During Previous Year in College Coursework

Hours	Frequency
0	65(53.7)
1-10	10
11-20	10
21-30	12
31-40	10
41-50	2
51-60	6
61-70	-
71-80	1
81-90	1
91-100	1
101-110	-
111-120	1
-	
171-180	1
-	
231-240	1

school or educational agencies, and 85.2% of the participants in events sponsored by professional or trade organizations.

Instructors' time spent in industry-based activities is reported in Table 10. Staff exchanges between industry and TIs were not a common activity, with 14.9% of the respondents participating. One instructor reported spending about five weeks in an exchange, but 16 of the 18 exchange participants spent less than 40 hours. Observation and visits to business and industry were relatively popular, with 74.4% of the instructors reporting time spent in this activity. However, 91.1% of these participants spent less than 40 hours. Supervision of students in internships and work experience was reported by 47.3% of the study respondents. With 40 or less hours of supervision time reported by 35.1% of those who reported supervision, it appears that supervision involves limited time per business site assuming a class size of 10 students.

The data in Table 11 present the instructors' reported time spent in professional activities. Involvement in professional and trade associations was reported by 57.9% of the instructors. Reading professional literature was reported by 86.8% of the respondents. Advisory committee or other committee work was reported by 84.3% of the responding instructors. Of the instructors who reported involvement in professional and trade

Table 9

Frequency Distribution of Instructors' Time Spent During Previous Year in Selected Updating Activities: Workshops, Conferences and Seminars

	Sponsored by		
Hours	Business and Industry	School or Educational Agencies	Professional or Trade Organizations
0	18(14.8%)	39(32.2%)	40(33.1%)
1-8	20	14	18
9-16	20	26	23
17-24	14	21	14
25-32	15	10	3
33-40	9	2	11
41-48	3	-	4
49-56	6	2	3
57-64	5	3	3
65-72	1	1	-
73-80	2	1	2
81-88	-	-	
89-96	-	-	
97-104	5	2	
105-112	1		
-			
149-156	1		
-			
173-180	1		

associations, 55.7% spent 16 or fewer hours during the year. Of the instructors involved in advisory committee or other committee work, 66.7% reported spending 16 or less hours during the year. While a very high percentage of the instructors reported reading professional literature, 69.5% spent 80 hours or less.

Objective 4: Major Barriers

Item 9 of the questionnaire asked the instructors to rate how much of a barrier each of a series of items posed in preventing them from becoming or remaining technologically up-to-date. The response scale was 1 = very low barrier, 2 = low barrier, 3 = moderate barrier, 4 = high barrier, and 5 = very high barrier. Table 12 presents the results.

"Not enough time in my schedule" was the highest rated barrier when the response scale values were used to calculate a mean rating value. "Funding not available for activities" was

Table 10

Frequency Distribution of Instructors' Time Spent During Previous Year in Selected Updating Activities: Industry Based

Hours	Observation and Visits	Staff Exchange	Supervision of Students
0	31(25.6%)	103(85.1%)	64(52.7%)
1-8	28	4	2
9-16	25	7	4
17-24	14	3	5
25-32	8	2	6
33-40	7	-	3
41-48	1	1	2
49-56	1	-	1
57-64	-	-	4
65-72	1	-	1
73-80	1	-	2
81-88	-	-	-
89-96	1	-	2
97-104	1	-	3
105-112	-	-	-
113-120	2	-	8
-			
156-164		-	1
-			
177-184		-	5
193-200		1	2
-			
233-240			1
241-248			-
249-256			1
-			
353-360			1
-			
393-400			2
-			
497-504			1

the second highest rated barrier. The third ranking barrier was "activities too far away." It was viewed as a moderate barrier with a mean of 3.15. With a mean of 2.53, the item "activities available are inadequate" was rated a very low or low barrier by 56 respondents, but 39 respondents rated it a moderate barrier.

The differences in ratings of barriers by instructors in the high and low participation groups was evaluated using t-tests. The results are reported in Table 13. None of the barriers were significantly different at the .05 level. It should be noted

Table 11

Frequency Distribution of Instructors' Time Spent During Previous Year in Selected Updating Activities: Professional

Hours	Membership	Reading	Committees
0	51(42.1%)	16(13.2%)	19(15.7%)
1-8	11	7	42
9-16	28	11	26
17-24	12	14	16
25-32	7	12	5
33-40	5	10	4
41-48	1	1	3
49-56	3	8	2
57-64	-	7	3
65-72	-	-	-
73-80	1	3	1
81-88	-	1	
89-96	-	-	
97-104	2	14	
105-112		1	
113-120		2	
-			
149-156		3	
-			
177-184		1	
-			
193-200		6	
-			
297-304		1	
-			
393-400		2	
-			
999		1	

that significance at the .07 level was calculated for the item "activities are not available within a reasonable distance" and the low participation group rated this barrier higher. Examination of the group means shows the "distance" barrier ranks second for the low participation group versus fourth for the high participation group.

Objective 5: Self-perceived Need for Updating

Instructors were asked to rate their need for technological updating relative to knowledge and ability to apply technology using the scale 1 = very low need for technical updating, 2 = low need for technical updating, 3 = moderate need for technical

Table 12

Frequency Distribution, Mean and Standard Deviation for Instructors' Ratings of Selected Barriers to Becoming or Remaining Technologically Up-To-Date

Item	nr	Rating 1	2	3	4	5	M	SD
Not enough time in my schedule	-	5	13	24	36	43	3.8	1.15
School does not provide paid time off	7	22	18	30	19	25	3.1	1.40
Activities too far away	2	17	22	29	27	24	3.2	1.33
No encouragement from school	3	56	28	23	8	3	1.9	1.08
Activities available are inadequate	6	27	29	39	11	9	2.5	1.18
Funding not available for activities	4	20	14	28	25	30	3.3	1.41
Lab equipment is not current	4	48	35	21	10	3	2.0	1.08

Note. The scale was 1 = very low barrier to 5 = very high barrier. The nr indicates no response.

updating, 4 = high need for technical updating, and 5 = very high need for technical updating. Table 14 presents the results.

For the item "knowledge of new technology in my area," 57.9% of the instructors indicated a high need or very high need for updating. This is reflected in the mean rating of 3.9 for all respondents. Only 6.6% of the respondents reported no need (no response), very low need, or low need for technical updating.

Ability to apply technology in the laboratory or classroom was reported to be a slightly lower need than the knowledge item. The mean rating was 3.5. However, 42.1% of the respondents indicated a high or very high need for updating in the area of applying technology.

Comparison of the mean ratings of the high and low participation groups using t-tests resulted in significant difference at beyond the .05 level of probability for both the

Table 13

Comparison of Ratings of Selected Barriers to Instructors' Becoming or Remaining Technologically Current for High and Low Activity Participation Groups

Item	Group	n	M	SD	t	DF	p
Not enough time in my schedule	High	40	4.1	1.04	1.38	78	.17
	Low	40	3.7	1.22			
School does not provide paid time off	High	40	3.2	1.46	-0.05	74	.96
	Low	36	3.2	1.56			
Activities are not available within a reasonable distance	High	39	2.8	1.38	-1.83	77	.07
	Low	40	3.4	1.31			
School does not encourage staff development	High	39	1.9	1.01	-0.94	76	.35
	Low	39	2.1	1.13			
Activities that are available are inadequate	High	39	2.7	1.20	0.26	74	.80
	Low	37	2.6	1.26			
Funding not available to pay for quality update activities	High	39	3.5	1.31	0.93	75	.35
	Low	38	3.2	1.53			
Lab equipment available is not current	High	40	2.2	1.14	0.46	75	.65
	Low	37	2.1	1.14			

Note. The scale was 1 = very low barrier to 5 = very high barrier.

knowledge and application items. Table 15 shows the results. The high participation group individuals expressed a higher need for updating.

In Item 11, the instructors were requested to record the number of hours that they felt they would need in the next 12 months to either remain or become current. Table 16 contains the response information.

Of the respondents to this item, 55.2% estimated they needed 40 or less hours to remain or become current in knowledge of new technology in their area, and an additional 24.1% estimated a need to spend 41 to 80 hours. The remaining 20.7% of the respondents estimated a need that ranged from 97 hours to 999-plus hours. The distribution suggests that 40 hours is a

Table 14

Frequency Distributions, Means and Standard Deviations for Instructors' Self-Ratings of Need for Technological Updating

Item	nr	Need 1	2	3	4	5	M	SD
Knowledge of new technology in my area	2	2	4	43	27	43	3.9	1.00
Ability to apply technology in the laboratory or classroom	4	4	11	51	23	28	3.5	1.06

Note. The scale of need was 1 = very low need to 5 = very high need. The nr indicates no response.

Table 15

Comparison of Instructors' Reported Need to Become or Remain Technologically Current in Selected Areas for High and Low Activity Participation Groups

Item	Group	n	M	SD	t	DF	p
Knowledge of new technology in my area	High	40	4.1	1.04	2.15	77	.03
	Low	39	3.6	0.97			
Ability to apply technology in the laboratory or classroom	High	40	3.7	1.02	2.99	76	.00
	Low	38	3.0	1.05			

Note. The need scale was 1 = very low need to 5 = very high need for technical updating.

better estimate of the time needed to remain or become technically current than the mean estimate of 67.4 hours with the standard deviation of 74.6 hours.

The responses for estimated time needed to become or remain current in ability to apply technology in the laboratory or classroom also were distributed in a skewed manner. It should be noted that 15 persons did not respond. An estimated need for 40 or less hours was made by 64.2% of those responding while an additional 17.9% estimated a need for between 41 to 80 hours. An estimate of 32 hours appears to be a better estimate of the time needed to become or remain current in the ability to apply

Table 16

Frequency Distribution of
Instructors' Estimated Time Needed in the
Next 12 Months to Remain or Become Technically Current

Hours	Knowledge of New Technology In My Area	Ability to Apply Technology in the Laboratory or Classroom
no response	5	15
0	1	3
1-8	7	9
9-16	8	11
17-24	12	15
25-32	14	15
33-40	22	15
41-48	8	1
49-56	-	8
57-64	9	9
65-72	1	-
73-80	10	1
-		
97-104	4	6
-*		
113-120	6	7
-		
145-152	2	-
-		
193-200	7	1
-		
233-240	-	1
-		
297-304	2	1
-		
313-320	1	-
-		
497-504	1	-
-		
999	-	3
M	67	73
SD	75	166

technology than the mean of 73.2 hours, because 50% of the respondents estimated 32 or less hours needed.

The comparison of high and low participation group means for hours needed to become or remain technically current relative to knowledge and ability to apply technology yielded t-values which indicated significant differences at beyond the .05 level. Table

17 summarizes the data. As shown in the frequency distributions presented in Table 16, there was a wide range in the hours reported, and Satterthwaite's solution (Howell, 1983) was used to deal with the unequal variances. Again, it appears clear that the high participation group members feel the need to participate at higher hour levels to become or remain current.

Table 17

Comparison of Instructors' Reported Hours Needed to Become or Remain Technologically Current in Selected Areas for High and Low Activity Participation Groups

Item	Group	n	M	SD	t	DF	p
Knowledge of new technology in my area	High	39	92	97	2.39	62.7	.02
	Low	37	48	58			
Ability to apply technology in the laboratory or classroom	High	39	138	259	2.24	40.5	.01
	Low	29	29	40			

Note. Satterthwaite's solution was used to deal with unequal variances.

Objective 6: Criteria Suggested for Assessing Currency

Item 12 instructed the respondents to assume that they were asked to provide criteria for assessing the technological currency of an instructor in a program similar to theirs and to describe the five most important criteria which they would provide. Thirty-six of the respondents provided items that were not criteria for assessing technological currency, and 32 individuals did not respond. The responses were tabulated by reviewing the items reported with the goal of grouping similar items. Table 18 includes the categories of criteria abstracted by the researchers and the specific criteria within groups with the frequencies of each item.

The results must be interpreted in view of the fact that individuals were able to provide up to five criteria. The criteria suggested were not unique, with "knowledge" being the most frequently suggested criteria (50) followed by "work activity" (38) and "updating activities" (34).

Table 18

Instructors' Suggested Criteria for Assessing the Technological Currency of an Instructor in Their Program Area

Criteria	Frequency
WORK ACTIVITY	38
Work experience	13
Experience in past 2 years	11
Recent relevant work experience	3
Years of experience in industry	2
Management level experience in industry	1
Where worked	1
Equipment used	3
Age of equipment work experience was on	2
Work in industry while employed teaching	1
What job duties were performed	1
UPDATING ACTIVITIES	34
Update seminar, workshop, coursework	12
Hands-on workshops, seminars and conferences	2
Current factory schools	2
Attendance business and industry activity	7
Time spent in business and industry activity	3
Time spent in updating	2
Type and kind of seminars attended	1
50 hours of workshop per licensing period	2
Recentness of update	1
40 hours per year of updating	1
Vendor provided training	1
KNOWLEDGE	50
Ability to apply knowledge specific to occupation	13
Ask specific technical questions (e.g. How would you adjust a _____?)	15
Knowledge of concepts	6
New changes not aware of	1
Involvement in computer training	1
Exposure to telemarketing	1
Employer information	1
Knowledge of hardware/software	9
Basic background in subject matter (vocational training)	3

Table 18 (continued)

Criteria	Frequency
EXTERNAL EVALUATIONS	15
Student evaluations	4
Graduates are recruited by progressive companies because of currentness	1
Ease of student transitions to work roles	1
Class evaluations by students	1
Interview employers of graduates	5
Licensed/ASE certification	1
Evaluation by advisory board	2
PERFORMANCE TEST	5
Written test	1
Performance test/machine operation	4
ATTITUDE/MOTIVATION	17
Names of industry contacts/willingness to make contacts	4
Membership in trade groups	1
Visits to other schools	1
Awareness of industry expectations	2
How well likes the job	1
Attitude toward change	1
Willingness to attend updating classes/ meetings	4
Professional and industry publications read	3
TEACHING ACTIVITIES	9
Industry instructional materials used in courses	3
Time spent practicing applications of new technology	1
Ability to relate new technology to present equipment	1
Assess changes made in instruction	2
Content of course syllabus	1
Committee work in relevant area	1
RESPONSES JUDGED UNCLEAR	36
NO RESPONSE	32

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

A number of conclusions may be drawn based on the findings of this research.

1. Formalized staff development programs, defined as those including regularly scheduled activities and written institutional staff development policy, were not identified within the TIs. Directors agreed with the majority of the instructors' observations on the absence of these factors with one exception. The majority of the instructors in school A did not agree with their director on the lack of regularly scheduled activities. Communication of staff development information appears to need additional director attention. Directors reported that (a) irregularly scheduled activities were provided; (b) funds were provided for updating activity registration, travel, lodging and meal costs; and (c) paid time off was provided for technical updating activities. None of the directors reported institutional-level budgeted dollars for technical updating activities. Funds apparently were drawn from department or unit level budget items.

2. The instructors' responses to items concerning their schools' staff development opportunities and practices were not in high agreement with their directors' responses. For 19 of the 45 questions, instructors' and their directors' responses were in agreement less than 70% of the time. Only 9 of the 45 items had over 90% agreement between instructor and director responses.

3. The instructors were found to have been rated technically current by the external evaluators who were on the SBVTE evaluation teams. This finding is reassuring, but to some degree conflicts with the perception of many who report that technical currency is a major problem facing TIs with instructors who have been out of industry for a significant time (often defined as three to five years). Assuming that the perceived technical currency assessment process was reliable, the technical currency problem may actually be one of anticipated preventive maintenance or obsolescence prevention. However, it also may be useful to question the reliability of the evaluation system and attempt to

determine if a more effective assessment process needs to be developed.

4. Experienced instructors rated the 14 technical updating activities as moderately to highly effective in helping them remain technologically up-to-date. The four highest ranked activities, based on mean ratings were (a) workshops, conferences and seminars by business and industry (4.3); (b) work experience internships (4.1); (c) workshops, conferences and seminars by professional and trade organizations (4.0); and (d) industry observation and visits (3.9).

5. Significant correlations between instructors' ratings of activity effectiveness and levels of participation were logically expected and found. Significant relationships ($p < .06$) were found for all activities except (a) work experience internships; (b) education and industry staff exchanges; (c) professional literature; (d) university and college course work; and (e) workshops, conferences and seminars by school or other educational agency. The limited opportunity to participate in internships and exchanges in the reference year contributed to the low correlations for these items. The availability of literature, course work, and school or other educational agency workshops resulted in more participation than effectiveness ratings would suggest.

6. The instructors less involved in staff development activities, defined as those in the lower one-third of the distribution of total hours of participation in staff development activities, rated the effectiveness of the selected activities lower in all cases. Statistically significant differences were reported for 9 of the 14 activities. The group means were not significantly different for the two highest ranked activities: (a) workshops, conferences, seminars by business and industry; and (b) work experience internships.

7. Forty hours appears to be the upper limit on time committed to an individual staff development activity by most instructors with the notable exceptions of work experience internships, part-time employment, education and industry staff exchanges, and outside consulting. These exceptions probably indicate that highly motivated persons are involved and monetary incentives exist, or at least an absence of monetary barriers.

8. Instructors rated "not enough time in my schedule" as the most substantial barrier (mean of 3.8 on a scale with 4 = high barrier) to becoming or remaining technologically current. They rated the next three items as moderate barriers (3 = moderate barrier): (a) funding not available for activities (3.3), (b) activities to far away (3.2), and

(c) school does not provide paid time off (3.1). The importance of staff development policy and budget and effective communications about these items is clearly implied in these ratings. The time barrier is a real constraint for most adults. It is apparently necessary to have paid release time from normal work duties or incentives which will change time priorities for non-work time to insure many instructors' involvement in technical updating activities. The low participation instructor group ranked "distance" as the second barrier, suggesting that low participation instructors have particularly high priorities for personal time.

9. The instructors indicated a "high need" for updating relative to knowledge of new technology, reporting a mean rating of 3.9 (4 = high need). They also indicated a moderate to high need (3.5) for updating relative to ability to apply technology in the laboratory or classroom. The mean ratings of the high and low participation groups were significantly different for both of these items. The low participation group reported lower need for updating. The parallel questions concerning hours needed to become or remain technically current confirmed these differences in perceived need for updating.

10. The distribution of instructors' estimated times needed to become or remain current in knowledge of new technology in their area suggests that 40 hours per year is a good estimate of time needed by current experienced instructors. Fifty-five and six-tenths percent of the respondents estimated a need for 40 or less hours. Similarly, a good estimate of the time needed by current experienced instructors to become or remain current in ability to apply technology in the laboratory or classroom is 32 hours per year. Fifty percent of the respondents estimated a need for 32 or less hours.

11. Instructor-suggested criteria for assessing the technical currency of an instructor were not unique, with criteria falling into typical categories. In order of frequency of suggested items, these categories were (a) knowledge, (b) work activity, (c) updating activity, (d) attitude/ motivation, (e) external evaluations, (f) teaching activities, and (g) performance test. The instructors' frequent recommendation of relatively subjective knowledge and work activity criteria as the means of assessing currency versus the limited suggestion of what appear to be more precise means of assessment, such as performance tests, is not surprising. It does appear to be somewhat contradictory in that students supposedly are evaluated in the performance testing mode.

The conclusions for this study suggest a number of important considerations in addressing the experienced TI instructors' need to remain technologically current.

First, the clear communication of the Institutes' staff development program and budgetary commitment, particularly the incentives (barrier reducers) related to participation in technical updating activities, is essential. The communication effort needs to be continuous and consistent if instructors are to be well informed of administrative commitment and concern and their opportunities and sources of support.

Second, the apparent subjectivity of the typical processes for judging technical currency of instructors and the obvious subjectivity of self-assessed needs for technical updating suggest the need to develop a procedure that assists instructors in validating their upgrading needs. The lower participation rate of instructors who rate updating actually less effective might also be explained in this process.

Third, the rated effectiveness of technological updating is directly related to the proximity of the activity to the worksite or the personnel using the technology. Unfortunately, updating activities provided at the worksite are often the most costly type of instruction, and controlling costs can result in selecting activities viewed as less effective. A perceived commitment to staff development is nonexistent without funding to support quality activities.

Fourth, with "time in my schedule" perceived as the most significant barrier to becoming or remaining technologically current, teacher contracts which provide regularly scheduled paid time for individual updating activities or equally powerful barrier reducers need to be considered. A two-week time-frame appears to be a reasonable target for experimental contracts to evaluate a programmatic effort to prepare for emerging technological change, given estimated times needed to remain current (40 + 32).

Recommendations

A number of recommendations for practice evolve from the findings of this study.

1. Administrators need to continue to strive to improve the communication of their institutional staff development policy to instructors. In comparing policy question responses, instructor agreement with their director's answers was 70% or less on 19 of 45 responses. The practices of establishing regularly scheduled inservice activities, maintaining written staff development policy and establishing an institutional-

level staff development budget line are communication vehicles which appear under-utilized and worthy of application.

2. A reliable system of assessing technical currency needs to be established which provides the individual instructor with data for self-assessment. Since instructors who participated in updating activities at the higher rates expressed higher needs for updating, the self-identification of technical updating needs promises to be highly motivating and appears to be a good predictor of instructor involvement in updating activities.

3. Work experience internships should be evaluated using cost-benefit procedures as part of a pilot program designed to make a significant number of internships available. The instructors rated work experience internships as having high effectiveness, but participation was relatively low (28.1%) suggesting that barriers were limiting participation and cost is a logical concern in internships.

4. When planning technical updating for instructors, priority should be given to workshops, conferences and seminars by professional and trade organizations, and industry observation and visits because these were the activities instructors gave the highest effectiveness ratings.

5. A study of the instructors who participate in technical updating activities for relatively limited amounts of time should be conducted to examine such issues as their perception of need and barriers that limit their participation. The fact that low participation level individuals expressed lower perceived need for upgrading suggests the additional information from these individuals may provide additional insight for planning and encouraging participation.

6. Based upon the instructors' estimated time to remain or become current, the SBVTE and local administrators should consider a planning strategy which establishes 72 hours of technical updating activities (40 for knowledge + 32 for application) per year per instructor as a goal. This will establish commitment to helping instructors remain technically current and address major barriers.

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APPENDIX

TECHNICAL UPDATE QUESTIONNAIRE

TECHNICAL UPDATE QUESTIONNAIRE

Name_____

The following questions are being asked to identify the nature of technical updating which TI instructors need, have completed, and the most effective methods and strategies for providing technical updating activities to TI instructors.

1. Check off all of the practices which apply to your school:

a._____ Regularly scheduled technical updating workshops or courses
b._____ Irregularly scheduled technical updating workshops or courses
c._____ Written staff development policy
d._____ Paid subscriptions to journals or other publications
e._____ Paid personal memberships in professional organizations
f._____ Reimbursement for non-credit technical updating workshops or courses
g._____ Reimbursement for credit technical updating workshops or courses
h._____ Paid travel for technical updating activities
i._____ Paid lodging and meals for technical update activities
j._____ Other_____

2. Does your school offer sabbatical leave (i.e., extended time off to pursue refresher/educational updating activities)? Check the appropriate response(s).

a._____ 100% paid sabbatical leave available
b._____ Limited (less than 100%) paid sabbatical leave available
c._____ Unpaid sabbatical leave available
d._____ No sabbatical leave available (GO TO QUESTION #5)

3. If either fully paid or partially paid sabbatical leave is available in your school, please complete a, b, and c below, otherwise (GO TO QUESTION #4)

a._____ Percentage of regular salary paid during sabbatical leave
b._____ Number of paid sabbatical leaves available per year

c. How frequently may an instructor take a paid sabbatical leave?

_____

_____

4. How frequently may an instructor take an unpaid sabbatical leave?

_____

_____

5. Does your school allow paid time off for instructors each month for technical updating activities?

a._____ no _____ yes (if yes, complete the most appropriate response below)
b._____ hours per month available (fill in number)
c._____ no specific number of hours

6. Does your school have a budgeted dollar amount for technical update activities per year?

a. _____ no _____ yes _____ unknown
b. If yes, indicate the budgeted dollar amount per year

7. Using the scale below, rate the effectiveness of the following activities in helping you to remain technologically updated. Circle the appropriate effectiveness rating for each item as it pertains to technical updating:

N/A = not applicable
1 = very low effectiveness
2 = low effectiveness
3 = moderate effectiveness
4 = high effectiveness
5 = very high effectiveness

a. Work-experience internships----------N/A 1 2 3 4 5
b. University and college coursework--------N/A 1 2 3 4 5
c. Workshops, conferences and seminars sponsored by:
   1. business and industry----------N/A 1 2 3 4 5
   2. school or other educational agencies-N/A 1 2 3 4 5
   3. professional and trade organizations-N/A 1 2 3 4 5
d. Industry observation and visits----------N/A 1 2 3 4 5
e. Education and industry staff exchange----N/A 1 2 3 4 5
f. Part-time employment----------N/A 1 2 3 4 5
g. Professional and trade memberships-------N/A 1 2 3 4 5
h. Supervision of students in internship or work experience programs----------N/A 1 2 3 4 5
i. Professional literature----------N/A 1 2 3 4 5
j. Advisory committee or other committee work----------N/A 1 2 3 4 5
k. Outside consulting work----------N/A 1 2 3 4 5
l. Job placement of students----------N/A 1 2 3 4 5
m. Other _____-----N/A 1 2 3 4 5

8. Please list the amount of time (in hours) you have spent during the previous 12 months in each of the following activities:

_____ a. Work-experience internships
_____ b. University and college coursework
_____ c. Workshops, conferences and seminars sponsored by:
  1. business and industry
  2. school or other educational agencies
  3. professional and trade organizations
_____ d. Industry observation and visits
_____ e. Education and industry staff exchange
_____ f. Part-time employment (outside of school employment)
_____ g. Involvement in professional and trade associations
_____ h. Supervision of students in internships and work experience
_____ i. Reading professional literature
_____ j. Advisory committee or other committee work
_____ k. Outside consulting work
_____ l. Other _____

9. Using the following scale, rate how much of a barrier, each of the following items pose in preventing YOU from becoming or remaining technologically updated. Circle the appropriate barrier rating for each item:

1 = very low barrier
2 = low barrier
3 = moderate barrier
4 = high barrier
5 = very high barrier

a.	Not enough time in my schedule----------	1	2	3	4	5
b.	School does not provide paid time off-------	1	2	3	4	5
c.	Activities are not available within a reasonable distance----------	1	2	3	4	5
d.	School does not encourage staff development-	1	2	3	4	5
e.	Activities that are available are inadequate	1	2	3	4	5
f.	Funding not available to pay for quality update activities----------	1	2	3	4	5
g.	Lab equipment available is not current------	1	2	3	4	5
h.	Other _____---	1	2	3	4	5

10. Using the following scale, rate your need for technological updating in the following areas. Circle the appropriate need rating:

1 = very low need for updating
2 = low need for updating
3 = moderate need for updating
4 = high need for updating
5 = very high need for updating

a. Knowledge of new technology in my area------ 1 2 3 4 5
b. Ability to apply technology in the laboratory or classroom---------- 1 2 3 4 5

11. Record the number of hours you feel you would need in the next 12 months, to either remain or become current in the following areas:

a. _____(hrs) Knowledge of new technology in my area
b. _____(hrs) Ability to apply technology in the laboratory or classroom

12. Assume you were asked to provide the criteria for assessing the technological currency of an instructor in a program similar to yours. Describe the five most important criteria which you would provide:

1. _____
2. _____
3. _____
4. _____
5. _____